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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/507,542	02/18/2000	Joseph K. Davidson	P950	8012

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EXAMINER

GARCIA OTERO, EDUARDO

ART UNIT	PAPER NUMBER
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2123

3

DATE MAILED: 04/09/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/507,542

Applicant(s)

DAVIDSON ET AL.

Examiner

Eduardo Garcia-Otero

Art Unit

2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 August 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION: Non-Final (first action on the merits)

Introduction

1. Title is: METHOD AND APPARATUS FOR GEOMETRIC VARIATIONS TO INTEGRATE PARAMETRIC COMPUTER AIDED DESIGN WITH TOLERANCE ANALYSIES AND OPTIMIZATION
2. First named inventor is: DAVIDSON
3. Claims 1-20 have been submitted, examined, and rejected.
4. This is the first action on the merits.

Index

5. **Iannuzzi** refers to US Patent 5,586,052.
6. **Hoppe** refers to US Patent 6,137,492.
7. **Krishnamurthy** refers to US Patent 6,256,039.
8. **Ballas** refers to US Patent 4,800,652.
9. **Carlstrom** refers to US Patent 5,875,264.
10. **Rose** refers to US Patent 5,574,468.
11. **Kedem** refers to US Patent 4,649,498.
12. **Kamiguchi** refers to US Patent 5,549,857.
13. **Maxey** refers to New Riders' Reference Guide to AutoCAD 13, by Randall A. Maxey et. al., New Riders Publishing, 1995, ISBN 1-56205-237-3, pages 227-229 (DIM), pages 227-284 (DVIEW), 674-679 (TOLERANCE and parallelism).
14. **McGraw-Hill Dictionary** refers to The McGraw-Hill Dictionary of Scientific and Technical Terms, Sixth Edition, by McGraw-Hill Companies, Inc., ISBN 0-07-042313-X, 2003:

barycentric coordinates "The coefficients in the representation of a point in a simplex as a linear combination of the vertices of the simplex."

simplex "An n-dimensional simplex in a Euclidean space consists of $n + 1$ linearly independent points... a triangle with its interior and a tetrahedron with its interior are examples."

Priority-acknowledged

15. Acknowledgment is made of applicant's claim to U.S. Provisional application serial No. 60/120,961 filed Feb. 19, 1999.

Drawings-draftperson objection

16. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed. Specifically, see the enclosed Form 948, Notice of Draftperson's Drawing Patent Review which objects to the drawings.

Request for Information

17. The Examiner requests copies of the following publications because they appear to be especially germane to the claimed invention. In responding to this request, where the document is a bound text or a single article over 50 pages, the request may be met by providing copies of those pages that provide the relevant subject matter. See MPEP 704.14.
18. The Examiner requests copies of:
19. "ANSI/ASME Y14.5 1994 standard on tolerances" referenced at page 9 of the specification,
20. "Introduction to Geometry" at specification page 19,
21. "Instantaneous Properties of Multi-degrees of Freedom Motions-Line Trajectories" at specification page 24,
22. "Analytic Geometry of Three Dimensions" at specification page 25,
23. "On a new geometry of space" at specification page 26,
24. "Kinematic geometry of mechanisms" at specification page 26,
25. "The Theory of Screws" at specification page 28,
26. "HA Computational Model for Geometric Dimensions and Tolerances Consistent with Engineering Practices" at specification page 30,
27. and "Representation and mapping of geometric dimensions from design to manufacturing" at specification page 30.
28. Additionally, the Examiner requests copies of a user manual for each of three engines: one commercial geometry engine, one commercial constraint solver, and one commercial tolerance analysis package, as discussed at specification page 18.

Claim Interpretation

29. **The claim language is interpreted in light of the specification.** Limitations from the specification must not be imported into the claims, but definitions from the specification must be imported into the claims.

30. Claim 1 states “**tolerance map**”, which is interpreted as “a convex volume whose shape depends on the tolerance type and whose size depends on the tolerance values” at specification page 10 line 8, or “finite set of multivariate regional models” at specification page 17 line 9.
31. Claim 20 states “geometry engine system M1”, which is inconsistent with FIG 13 element “M1 Geometry Definition System”, and is also inconsistent with page 45 line 1 “module M1 for geometry definition”. The Examiner interprets the Claim 20 modules as equivalent to the FIG 13 modules. The Examiner suggests that the specification, or figures, or claims should be amended to yield consistent module terminology.

Claim Rejections - 35 USC § 102(b)

32. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action: A person shall be entitled to a patent unless – (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
33. **Claim 1-5, 7-8, 16-17, and 19 are rejected under 35 U.S.C. 102(b) as being anticipated.**
34. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.
35. Claim 1 is an independent claim with 3 limitations
36. **A-representing tolerance zone for each geometric feature of said object by a model with an algebraic form and a geometric form as a tolerance map** is disclosed by Iannuzzi at abstract “input of geometric data representing features of a manufactured part and data representing datums and tolerances for the features”.
37. **B-computing... interdependencies between said stored maps** is disclosed by Iannuzzi at abstract “Relationships are established between the data and degrees of freedom are determined for the part features and tolerances”.
38. **C-selecting tolerance conditions for said object to optimize allocation of tolerances** is disclosed by Iannuzzi at abstract “determine if the tolerance plan defined by a designer is complete and well formed. If it is not, the designer may then revise the tolerance plan to provide for a more consistent and useful tolerancing plan resulting in higher quality, lower cost manufactured parts and assemblies”.
39. Claim 2 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.
40. Claim 2 depends from Claim 1, with 1 additional limitation.

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41. **tolerance map representing a plane** is disclosed by Iannuzzi at Column 5 line 13 “plane”.
42. Claim 3 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.
43. Claim 3 depends from claim 1, with 1 additional limitation.
44. **tolerance map representing a axis or edge** is disclosed by Iannuzzi at Column 5 line 13 “cylindrical or spherical surface”. Note that cylinders are represented by an axis, a diameter, and a height.
45. Claim 4 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.
46. Claim 4 depends from claim 1, with 1 additional limitation.
47. **cylindrical surface** is disclosed by Iannuzzi at Column 5 line 13 “cylindrical or spherical surface”.
48. Claim 5 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.
49. Claim 5 depends from claim 1, with 1 additional limitation.
50. **position** is disclosed by Iannuzzi at Column 5 line 26 “datum”.
51. Claim 7 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.
52. Claim 7 depends from claim 1, with 1 additional limitation.
53. **variational possibilities of features** is disclosed by Iannuzzi at abstract “revise the tolerancing plan”.
54. Claim 8 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.
55. Claim 8 depends from claim 1, with 1 additional limitation.
56. **variational possibilities of features** is disclosed by Iannuzzi at abstract “revise the tolerancing plan”.
57. Claim 16 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.
58. Claim 16 depends from claim 1, with 1 additional limitation.
59. **validated using degree of freedom** is disclosed by Iannuzzi at abstract “degrees of freedom”.
60. Claim 17 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.
61. Claim 17 depends from claim 16, with 1 additional limitation.
62. **forming datum reference frames as rigid sets for target features and feature patterns** is disclosed by FIG 3 element 26 “Datum Reference Frame List”.
63. Claim 19 is rejected under 35 U.S.C. 102(b) as being anticipated by Iannuzzi.

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64. Claim 19 depends from claim 16, with 1 additional limitation.

65. **identifying redundant or conflicting restraints by using a degree of freedom** is disclosed by Iannuzzi at abstract “degrees of freedom”.

Claim Rejections - 35 USC § 103

66. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action: (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

67. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

68. **Claims 6, 9-15, 18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable.**

69. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iannuzzi in view of Hoppe.

70. Claim 6 depends from claim 1, with 1 additional limitation.

71. Iannuzzi does not explicitly disclose the additional limitation.

72. **composite tolerances constructed as a Minkowski sum** is disclosed by Hoppe at Column 19 line 2-15 “space error exceeds a pre-determined tolerance... Hausdorff distance and Minkowski sum are known to those skilled in the art”.

73. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Hoppe to modify Iannuzzi. One of ordinary skill in the art would have been motivated to do this in order to measure errors in “progressive mesh representation for a graphical geometric model” according to Hoppe abstract.

74. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iannuzzi in view of Krishnamurthy.

75. Claim 9 depends from claim 2 (“plane”), with 1 additional limitation.

76. Iannuzzi does not explicitly disclose the additional limitation.

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77. **variational possibilities of features of said object expressed in Barycentric coordinates** is disclosed by Krishnamurthy at Column 24 line 19 “barycentric coordinates of the face point”.

Note that “face” in Krishnamurthy is a plane.

78. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Krishnamurthy to modify Iannuzzi. One of ordinary skill in the art would have been motivated to do this in save memory space by using barycentric coordinates.

79. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iannuzzi in view of Ballas.

80. Claim 10 depends from claim 1, with 1 additional limitation.

81. Iannuzzi does not explicitly disclose the additional limitation.

82. **parallelism of variations of said geometric feature** is disclosed by Ballas at Column 25 line 63 “geometric features such as flatness, straightness, circularity, cylindricity, perpendicularity, angularity, parallelism, profile of a line or surface, runout (circular), runout (total), concentricity, and wall thickness... circular surfaces... other gometric shapes such as ellipses, lobed configurations, and even polygons”.

83. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Ballas to modify Iannuzzi. One of ordinary skill in the art would have been motivated to do this in order to model the standard mechanical tolerances, as listed by Ballas.

84. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iannuzzi in view of Ballas.

85. Claim 11 depends from claim 1, with 1 additional limitation.

86. Iannuzzi does not explicitly disclose the additional limitation.

87. **flatness of said geometric feature** is disclosed by Ballas at Column 25 line 63 “geometric features such as flatness, straightness, circularity, cylindricity, perpendicularity, angularity, parallelism, profile of a line or surface, runout (circular), runout (total), concentricity, and wall thickness... circular surfaces... other geometric shapes such as ellipses, lobed configurations, and even polygons”.

88. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Ballas to modify Iannuzzi. One of ordinary skill in the art would have been motivated to do this in order to model the standard mechanical tolerances, as listed by Ballas.

89. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iannuzzi in view of Carlstrom.
90. Claim 12 depends from claim 1, with 1 additional limitation.
91. Iannuzzi does not explicitly disclose the additional limitation.
92. **assembled geometric feature** is disclosed by Carlstrom at Column 1 line 60 “assemble therefrom a sequence of segments each having a geometric relationship to other segments”.
93. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Carlstrom to modify Iannuzzi. One of ordinary skill in the art would have been motivated to do this in order to model global tolerance interactions in assemblies of parts with local tolerances.
94. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iannuzzi in view of Rose.
95. Claim 13 depends from claim 4 (“cylindrical”), with 1 additional limitation.
96. Iannuzzi does not explicitly disclose the additional limitation.
97. **expressed in Pluecker coordinates** is disclosed by Rose at Column 12 line 23-25 “generating the Pluecker coordinates for said dispersed baselines such that predetermined gross error and DOA accuracy criteria are met”.
98. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Rosa to modify Iannuzzi. One of ordinary skill in the art would have been motivated to do this because Pluecker coordinates are an efficient way to manipulate cylindrical geometries (such as antennas in Rose).
99. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iannuzzi in view of Kedem.
100. Claim 14 depends from claim 3 (“axis or edge”), with 1 additional limitation.
101. Iannuzzi does not explicitly disclose the additional limitation.
102. **expressed in terms of line-solids** is disclosed by Kedem at Column 3 line 52 “line-solid classification... intersection”.
103. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Kedem to modify Iannuzzi. One of ordinary skill in the art would have been motivated to do this to identify conflicting tolerances (and under-constrained system),

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where individual parts may not fit properly (intersecting parts) at the given individual tolerances.

104. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iannuzzi in view of Kamiguchi.
105. Claim 15 depends from claim 4 (“cylindrical”), with 1 additional limitation.
106. Iannuzzi does not explicitly disclose the additional limitation.
107. **screw coordinates** is disclosed by Kamiguchi at Column 3 line 52 “screw coordinate”.
108. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Kamiguchi to modify Iannuzzi. One of ordinary skill in the art would have been motivated to do this because screws are common mechanical parts and are efficiently modeled using screw coordinates.
109. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iannuzzi in view of Official Notice (circular pattern).
110. Claim 18 depends from claim 17, with 1 additional limitation.
111. Iannuzzi does not explicitly disclose the additional limitation.
112. **datum reference frames are formed as rigid sets for a circular pattern of bolts** is Official Notice of circular pattern of bolts. The Examiner takes official notice circular patterns of bolts are well known in the art. For example, the flanges two sections of pipe are often bolted together, and thus the assembly has a circular pattern of bolts.
113. The Applicant is entitled to traverse the official notice according to MPEP § 2144.03. However, MPEP § 2144.03 also states “See also In re Boon, 439 F.2d 724, 169 USPQ 231 (CCPA 1971) (a challenge to the taking of judicial notice must contain adequate information or argument to create on its face a reasonable doubt regarding the circumstances justifying the judicial notice).” Specifically, In re Boon, 169 USPQ 231, 234 states “as we held in Ahlert, an applicant must be given the opportunity to challenge either the correctness of the fact asserted or the notoriety or repute of the reference cited in support of the assertion. We did not mean to imply by this statement that a bald challenge, with nothing more, would be all that was needed”. Further note that 37 CFR § 1.671(c)(3) states “Judicial notice means official notice”. Thus, a traversal by the Applicant that is merely “a bald challenge, with nothing more” will be given very little weight.

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114. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Official Notice (circular pattern) to modify Iannuzzi. One of ordinary skill in the art would have been motivated to do this because the flange plane is a convenient datum reference frame because the flange will probably mate to the global datum reference plane or to a second flange plane.
115. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admission (commercial software) in view of Maxey (AutoCAD).
116. Claim 20 is an independent claim with 10 limitations, A-J.
117. **A-geometry engine module E1** is disclosed by Applicant's Admission at specification page 18 "commercial software... a geometry engine (ACIS, e.g. parasolid or DesignBase)".
118. **B-constraint solver E2** is disclosed by Applicant's Admission at specification page 18 "commercial software... a constraint solver (e.g. D-Cubed DCM, 2D/3D, design sheet or MAPLE)".
119. **C-geometry engine system M1** is disclosed by Applicant's Admission at specification page 18 "commercial software... a geometry engine (ACIS, e.g. parasolid or DesignBase)". Note that specification page 45 states "The procedure for creating such a system from commercially available... is well known".
120. **E-tolerancing module M4** is disclosed by Applicant's Admission at specification page 18 "commercial software... tolerance analysis packages (e.g. Mech. Advantage, VSA-3D)".
121. **H-tolerance allocation module M6** is disclosed by Applicant's Admission at specification page 18 "commercial software... tolerance analysis packages (e.g. Mech. Advantage, VSA-3D)".
122. **J-statistical tolerance analysis package E2** is disclosed by Applicant's Admission at specification page 18 "commercial software... tolerance analysis packages (e.g. Mech. Advantage, VSA-3D)".
123. Applicant's Admission (commercial software) does not explicitly disclose the additional limitations.
124. **D-dimensioning module M2** is disclosed by Maxey page 227 "dimensioning mode".
125. **F-global visualization module M3** is disclosed by Maxey page 277 "dynamic view".

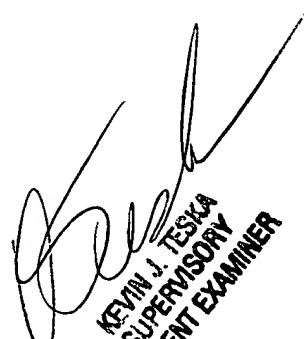
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126. **G-a D&T [datum and targets] Schema Advisor module M5** is disclosed by Maxey page 675 “geometric dimensioning and tolerance control frames”.
127. **I-local module visualization module M7** is disclosed by Maxey page 277 “dynamic view”.
128. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Maxey to modify Applicant’s Admission.
129. One of ordinary skill in the art would have been motivated to do this because Maxey (AutoCAD) serves as a modeling platform upon which to add commercial software moduluses for constraint, geometry, and tolerance.

Communication

130. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo Garcia-Otero whose telephone number is 703-305-0857. The examiner can normally be reached on Monday through Thursday from 9:00 AM to 7:00 PM.
131. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner’s supervisor, Kevin Teska, can be reached at (703) 305-9704. The fax phone numbers for this group are:
132. (703) 746-7238 --- for communications after a Final Rejection has been made;
133. (703) 746-7239 --- for other official communications; and
134. (703) 746-7240 --- for non-official or draft communications.
135. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the group receptionist, whose telephone number is (703) 305-3900.

* * * *


KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER